METHODS OF MAINTAINING FERTILITY ON SUCCESSFUL NEW JERSEY FARMS.*

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Agriculture in New Jersey is more highly specialized along clearly defined types than that of many states. This is due to three primary factors: viz., soils, markets and climate. Each type of agriculture has a system of maintaining fertility which has been developed by years of experience and farm practice. The most important types of agriculture in the state are the following:

Dairy	General
Potato	Poultry
Truck	Fruit

Of these six types only the first four will be discussed in the paper.

DAIRY—NORTH JERSEY.

The most extensive and clearly defined dairy farming exists in North Jersey upon soils of Glacial origin. The retreating glacier left a sheet of till consisting of clay, sand and gravel, deposited by streams issuing from the ice sheet. Much of this till is quite thin, so that the existing soils are the result of the disintegration of the underlying rock. The underlying rocks of this area consist largely of shales, slates, sandstones, gneissic and limestone rocks. The topography is rolling to rough, which furnishes an abundant amount of cheap pasture and hay land. About one third of the farms are tilled with the remainder of the area in pasture and rough, stony land.

The dairy farms in this soil province have an average of 20.3 cows on the owner farms and 26.3 cows on the tenant farms. Ninety per cent. or more of all the receipts were from milk and livestock products. Consequently, practically everything which was sold from the farm left it in the form of milk. The purchase of plant food through the purchase of feed for the cows, and the sale of milk shows an income and outgo of plant food. The sale of market milk from the farm is sometimes said to be exhaustive of the fertility. Practically

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all the crops raised, 90 per cent. or more, were fed to the cows and other stock, while much feed is purchased, namely, 2,227 pounds per cow on the owner farms, and 2,160 pounds per cow on the tenant farms.

TABLE I.—*Amount of plant food bought in feed and fertilizers and sold in milk on 460 dairy farms of Sussex County, New Jersey.*

Item.	Pounds.	Nitrogen, Pounds.	Phosphoric Acid, Pounds.	Potash, Pounds.
Concentrates	27,282,000	804,819	447,424	196,430
Fertilizer	514,000	10,280	41,120	51,400
Total	.....	815,099	448,544	247,830
Milk	68,673,550	315,898	147,648	117,431
Balance	.....	449,201	340,896	129,399

By taking the quantity of feed purchased, the amount of plant food obtained through feed can be reckoned. Deducting from this the amount of plant food sold in the milk, we find the balance of the plant food left for the farms. According to the data, these farms should be growing more fertile in spite of the small amount of fertilizer purchased. Less than one half as much plant food is sold in the milk as is purchased in the feed and fertilizers. However, much of this purchased plant food obtained in the feed is lost because the manure is not all applied to the growing crops. Some is lost in the pastures, and some is lost by poor care. Yet there would still be a large balance in favor of the purchase of plant food. By the judicious use of a little fertilizer with proper tillage, far better crops could be produced. Dairying as followed on these farms should increase fertility. These farmers are skilled dairymen, but not skilled in the production of crops. The money is made from cows, and not from crops. As a consequence, their methods of maintaining fertility on these farms as a whole are not admirable. They have more manure for their crop acres than is efficiently used. This is quite evident when we consider that 2.9 crop acres per cow were found on the owner farms and 2.7 crop acres per cow were found on the tenant farms. Most of this manure was applied to the hay land. Some was applied to corn and other grain, which is raised as feed for the cows. However, the more successful of these farms are adopting a shorter rotation, allowing hay to remain down two years or three years at the most, raising more corn, more small grain, and buying acid phosphate as a supplement to their stable manure.

The county agent during the last few years has shown, through his demonstrations, that there is no element so badly needed on these farms as the application of acid phosphate in connection with stable manure for the crops grown on these dairy farms. Thus, by shortening the rotations, growing more corn and small grains, larger crops were produced at a comparatively small expense, with considerable profit to the farmer. We might say, that the farms as a whole in this rotation maintain their fertility and crop yields by the purchase of almost no fertilizers, while successful farms purchase some fertilizers, most of which is acid phosphate, to supplement their stable manure. The following crops were raised on these farms: grass, corn, oats, rye, buckwheat and wheat; also some potatoes and truck.

Dairy Farms—Central Jersey.

The second and less highly specialized dairy industry of the state is located upon the red shales of the Piedmont Plateau province. This area is more tillable, has less stony, rough land, and is less rolling in topography. Because of this, 24 per cent. of the farm receipts are from crops and most of the remainder from cows.

A shorter rotation, consisting of corn, oats, wheat and grass (clover and timothy), one to three years, was used. These farms had an average of 13.1 cows, 4.3 horses and other stock, making an equivalent of about 20 animal units, and 75 crop acres. Approximately ten tons of concentrates and five tons of fertilizer were purchased per farm. The most successful farms having the best crop yields applied *45 per cent. more fertilizers per acre,* besides the usual amount of manure. These more successful farms usually had a shorter rotation, allowing grass to remain but one year and grew more grain. The writer, unfortunately, has not had the opportunity to determine the balance of plant food elements, but there probably is a balance in favor of the farm.

Potato Farms—Coastal Plain Soils.

The most highly specialized potato industry is located on what is known as the Sassafras loam soil of the Coastal Plain area. The surface soil consists of a brown mellow loam eight to twelve inches deep, while the subsoil ranges from a yellowish brown to reddish yellow heavy loam to silty clay loam. At a depth of twenty-eight inches or more, considerable sand and coarser material is found in the substrata. Other soil types of this coastal plain area grow potatoes, but not so well. Still, many are grown on the lighter, more sandy soils.

winter more successfully than if seeded alone. Some of the larger growers who do not finish digging until quite late, omit the clover and use only rye or wheat, since the late season allows for little development of the former. Therefore, to some extent the time of digging influences the nature of the cover crop used. For the latest seedings rye is more commonly used since it is more hardy than wheat and will give a more satisfactory cover when seeded late. Wheat appears to be more popular for the earlier seedings. It makes a more leafy growth, and if the spring plowing is delayed, it does not make such a rapid growth in the spring. Some of the fields will not grow crimson clover successfully, probably because of need of lime. Though this clover will stand a certain amount of acidity, it will eventually be driven out of acid soils.

Thus at a cost of $2 to $6 per acre for cover crop seed, together with the use of chemical fertilizer, it appears possible to maintain the organic content of these soils and keep them productive for continuous cultivation of potatoes.

This system is independent of the use of livestock which is almost universally looked upon as necessary in maintaining fertility. Neither do these potato growers, as a rule, buy or apply manure as is frequently the custom among truckers.

When potato ground is seeded to rye or wheat it is not necessary to replow, but merely to prepare by harrowing and to seed the crop. This makes it economical in the use of labor as well as in the use of fertilizer; unless the potato ground is quite light, sufficient residual fertilizer will be left after the potatoes are dug to grow the rye or wheat without additional application of fertilizers. Sometimes grass for the next year's hay is seeded after potatoes, without plowing, but by preparing with the harrow only, in the same manner as for the seeding of alfalfa.

On some of the lighter sandy land, cowpeas are seeded, plowed under and the area seeded to rye. Yields on such areas are low, yet considerable straw is produced. Hay is ordinarily left in the rotation one year only. On these light soils it is not profitable to allow a field to remain in grass after the clovers have died out.

Fertilizers.—The potatoes are given the major portion of all the commercial fertilizers purchased. This is an important charge against the crop, for the application is heavy. The usual amount is 1,200 to 1,800 pounds per acre. This usually is applied in the row at the time of planting the potatoes. In this way labor is saved over the separate application as followed in some potato-growing regions. The rye is lightly fertilized when it does not follow potatoes. On the lighter

Crops.—No definite system of rotation is followed on these potato farms. Wherever some system is practiced, the rotation may consist of potatoes one or more years, hay one or two years, and corn one year. Another system which is quite largely used consists of potatoes one or more years, rye or wheat one year, hay one or two years, and corn one year. Again, others attempt no rotation at all, and crop potatoes on the same area for an indefinite period. In such a case, corn, rye or wheat, and hay, may be rotated on other fields. However, the custom of raising potatoes continuously on the same area appears to be growing, and this practice restricts the potato area from the rotated portion of the farm. This is comparable to the use of alfalfa on most of the farms in other regions. This area, for the time it is occupied by the potato crop, is thrown out of rotation as long as the crop is successful. It is not uncommon to find a portion of the farm growing potatoes continuously, while in another part potatoes are used in a tentative rotation with corn, rye or wheat and hay. While this system appears to militate against all rotation principles, both from the standpoint of agronomy and farm management, yet these farms are very successful in maintaining their potato yields and in handling their labor economically. Thus it is a system peculiar in itself, but apparently adapted to the conditions as described in this area.

Farm Practice.—The farm practice of these farms is unique, as we would expect in such a type of farming. In many respects individual practices differ, but the method of handling the potato crop is uniform.

The basis and means of maintaining such an intensive industry depend to a large extent on the universal use of cover crops and fertilizers. There is no area in the State where cover crops are given such careful attention as on these potato farms. Much of the success of these crops is due to the large residual fertilizer application from the potatoes. Successful cover cropping needs fertile soil the same as other crops. It is only through this practice that the farmers are able to maintain soil fertility. Wheat, rye and crimson clover are the most common cover crops. But some crimson clover is seeded alone, at the rate of a peck or a half-bushel to the acre. Others use 1½ to 2 bushels of rye, while many use wheat. A large number combine crimson clover with rye or wheat, using 4 to 8 quarts of crimson clover with 1 to 1½ bushels of either rye or wheat. This makes a better cover crop because of greater growth of the wheat or rye, combined with the value of the clover in adding nitrogen. Furthermore, the rye or wheat protects the clover so that it will live through the

soils fertilizer is used at the rate of 200 to 400 pounds per acre for rye. Corn is frequently fertilized at the rate of 300 to 500 pounds of commercial fertilizer per acre. On the corn much of the manure obtained from the stock is applied. The grade of fertilizer most commonly used at the time of the survey was one showing an analysis of 4–8–10, *i. e.*, 4 per cent. of nitrogen, 8 per cent. of phosphoric acid and 10 per cent. of potash. Recent experiments of the New Jersey Agricultural Experiment Station show that a 4–8–5 potato produces larger yields than more or less potash. These results appear to agree with recent farm practice.

The fertilizer used for the corn was usually a 2–8–10, now a 3–10 or 4–10, or some potato fertilizer, and the same is used for rye. A very limited amount of top dressing for hay is practiced, nitrate of soda being used frequently for the purpose.

Plant Food Balance.—These men grow almost nothing but potatoes as a cash crop. Consequently, it is an easy matter to reckon the balance of plant food as they apply it in the form of commercial fertilizer and sell it in the form of potatoes and other farm crops. To show the plant food balance, the following table is representative of the successful potato farms on these soils.

PLANT FOOD BALANCE ON 40 MONMOUTH COUNTY POTATO FARMS, NEW JERSEY.

TABLE II.[1]—*Plant food removed by crops and through purchased fertilizers and manures on 40 successful potato farms of New Jersey.*

Crops sold.	Amount, Tons.	Nitrogen.	Phosphoric Acid.	Potash.
Potatoes	9186.7	31.23	14.69	53.28
Corn	54.2	.89	.38	.30
Wheat	52.0	.98	.28	.45
Rye	158.4	2.86	1.36	.91
Hay	285.0	3.39	.76	4.41
Total plant food sold		39.35	17.47	59.35

TABLE III.[2]—*Plant food purchased in fertilizer and manures on 40 successful potato farms of New Jersey.*

Kind.	Amount, Tons.	Nitrogen.	Phosphoric Acid.	Potash.
Commercial fertilizer	987.16	39.48	78.97	98.71
Stable manure	115.00	.57	.28	.57
Total plant food purchased		40.05	79.25	99.28
Total plant food sold		39.35	17.47	59.35
Difference		.70	61.78	39.93

[1] Analysis Henry's "Feeds and Feeding," pp. 582–585.

[2] Fertilizer 4–8–10. Manure $\frac{1}{2}$–$\frac{1}{4}$–$\frac{1}{2}$. Labor income, $1,224.

It is quite striking from this table that practically as much nitrogen purchased in the form of commercial fertilizers is sold in the form of farm crops. The major portion sold is represented in the potato crop. However, less than one third of the phosphorus applied in the form of commercial fertilizers was sold from these farms, while a little over one third of the potash was sold in the form of farm crops.

Livestock.—The addition of livestock on these potato farms did not increase the fertility, or materially decrease the cost of fertilizers. The following data show the influence of livestock on the potato yields and the fertilizer cost per acre.

TABLE IV.—*Relation of livestock to yield and fertilizers; cost in 1914–15.*

Stock Receipts Per Cent. of Total.	No. of Farms.	Crop Acres for Each Productive Animal Unit.	Acres of Potatoes.	Other Crop Acres.	Potato Yield per Acre.	Fertilizer Cost per Crop Acre.
5 per cent. or less.	63	20.9	30.9	44.4	86.7	$10.60
5.1–10.....	63	14.8	27.9	49.1	81.4	9.10
10.1–20.....	44	11.7	22.4	44.4	80.2	8.90
20.1–30.....	13	9.2	19.3	53.1	78.3	7.30
30.1 and over	11	5.8	17.9	42.8	73.2	9.60

The statement that livestock is essential to maintain fertility in extensive farming is not borne out by these figures. In fact, the farms with the smaller proportion of livestock are producing greater acre yields than those more heavily stocked. There is a consistent decrease in yield as the proportion of stock increases.

The amount of fertilizer purchased per crop acre is somewhat greater for those with the smaller proportion of livestock. But these farms, too, have a larger proportion of the crops in potatoes. As the major portion of the fertilizer is applied to the potatoes, it is evident that the more heavily stocked farms are using less fertilizer per farm, but more per crop acre of potatoes. This might indicate that the stocked areas are on poorer soils, but this does not appear to be the case. From these data it appears that a system of potato farming with green manures and commercial fertilizers is more efficient in maintaining and increasing fertility in this area than in the use of livestock. The lightly stocked farms purchased about seven tons of fertilizer more than those heavily stocked. These seven tons of commercial fertilizers, applied with the green manure cover crop, apparently is of more value in adding fertility than are the extra 6.9 animal units on these farms. It is merely a question of balancing one practice against another in maintaining fertility and production on the farm. In this case livestock apparently was not equal to commercial fertilizers and green manure cover crops as they are used in the area.

General Farms—Coastal Plain Soils.

Soils.—The soils of this area are largely loams, gravelly loams, clay loams, and sandy loams, and are better adapted to corn, small grain and grass than are the Freehold soils. Areas of sandy soil are found on some farms, giving a wide range of soil conditions. While some of these soils are adapted to potato growing, they are not so well suited for potato production as the Freehold soils.

Crops.—The principal crops in this vicinity are corn, grass and rye. Potatoes hold an important place on some farms, while wheat, fruit, and truck and a few miscellaneous crops are raised.

Farm Practice.—The rotation on the heavier soils consists of corn, one year; rye, one year; and grass, two or three years. Where potatoes can be raised the rotation is corn, one year; potatoes, one to three years; or rye, one year, and grass, one to three years. Frequently the area following corn is cropped part to potatoes and part to rye. The rotation is thus elastic and can be made to fit the needs of the farm and soil. On a few farms the operators follow a double rotation by growing corn, rye and hay on their heavier soils; and corn, potatoes and hay or corn, potatoes, rye and hay on their soils best adapted to the potato. After corn, a field is usually seeded to rye; the part of the field best adapted to potatoes is plowed (the rye being used as a cover crop) and planted to potatoes. In brief, then,—corn, rye and hay are the regular rotation crops, with potatoes planted on the part of the field or farm best suited to them. Occasionally on the sands and loamy sandy soils, cowpeas are seeded after rye harvest and plowed under in the fall; the field is reseeded to rye again and then to hay one year, followed by corn.

When potatoes are cropped for several years continuously on the same area, cover crops are used very similar to those of the Freehold area. These usually consist of rye, wheat, crimson clover or a combination of rye or wheat and crimson clover. However, the use of cover crops is not so prevalent or so well developed on most of these farms as on the potato farms in the Freehold district.

Fertilizers.—Stable manure is usually applied to the corn ground and commercial fertilizer is used on rye, potatoes and corn. The potatoes received 1000 to 1600 pounds of commercial fertilizer per acre. This was a 4–8–10 grade, now a 4–10–0 or 4–10–3 to –5. During the abnormal conditions caused by the war, the amount of potash has been decreased or omitted. The corn received 300 to 400 pounds of potash fertilizer of a cheaper grade, such as 2–8–7, now a 3–10. Rye received much the same fertilizer treatment as corn. When fol-

lowing potatoes, rye does not always receive fertilizers. While the fertilizer practice is not so well standardized as in some parts of the county, still the same practices prevail over much of the area. Wide differences in soils exist on these farms, making different fertilizer treatment as well as different cropping necessary.

Livestock.—These farms wherever truck and the lighter soils prevail, maintain their fertility largely through the use of cover crops, the same as the potato farms. However, the heavier type of soils are more inclined to keep livestock. The following tables will illustrate the effect of livestock upon the fertility of these general farms.

TABLE V.—*Relation of livestock to crop yields and fertilizers purchased on 260 general farms in Monmouth County, New Jersey, in 1914–15.*

Receipts from Livestock; Per Cent. of Total.	Crop Acres for Each Productive A. Unit.	Crop Index.	Acres of Potatoes.	Acres of Truck Per Farm.	Total Crop Acres.	Fertilizer Cost per Crop Acre.
Owner Farms (192)						
5 or less	17.6	97.8	9.9	4.9	66.7	$5.7
5.1–15	11.0	99.4	11.4	5.1	80.6	4.8
15.1–25	8.5	100.3	10.5	2.6	67.2	5.6
25.1–40	6.4	102.2	9.8	1.4	61.9	4.8
40.1–55	5.6	98.3	10.5	0.9	84.0	4.2
55.1 and over	4.3	90.3	3.7	1.7	50.9	3.2
Average	7.2	97.8	9.2	2.5	68.8	4.7
Cream Ridge Dairy Farms	4.4	97.8	3.1	1.0	89.2	1.7
Tenant Farms (68)						
15 or less	18.2	92.2	12.9	5.5	89.3	4.4
15.1–25	9.9	87.3	15.0	5.0	101.7	4.2
25.1–40	12.8	102.2	10.6	1.2	80.6	5.1
40.1–55	7.9	102.3	11.6	1.2	99.9	4.5
55.1 and over	6.4	89.6	4.1	1.3	88.9	2.0
Average	9.3	96.6	10.2	2.2	91.0	4.1

The crop yields appear about the same, regardless of the amount of livestock on the farm. This is in accordance with the results obtained concerning livestock on the potato farms of this county.

With the exception of the owner farms, which have 4.3 crop acres for each productive animal unit, the amount of fertilizer purchased is approximately the same per farm, regardless of the amount of stock. None of these farms are heavily stocked. During the summer cows are turned on pasture. The manure increase, therefore, would not be so large. Probably the difference in the amount of manure pro-

duced is not sufficient to make a noticeable difference in crop yields. The manure on many of these farms is not carefully husbanded. This would tend to nullify the value of stock for maintaining soil fertility. It is not the fault of the stock, but rather the methods of caring for the manure. Many of these farms are successful in their use of cover crops with potatoes and truck. Their rotations are not so long as to cause thin soil. In this manner they are able with the aid of commercial fertilizers to maintain their yields without depending upon stock. However, this does not decrease the value of stock for maintaining fertility on these farms. Under the system in vogue, stock had no apparent influence on crop yields and fertility. Again, farms not adapted to producing forage crops should not carry much stock.

The fertilizer cost per crop acre is comparatively low on dairy farms in this region. Less potatoes and truck also are raised on these farms, but the difference is not sufficient to allow such a large decrease in fertilizer expense and at the same time maintain the crop yields. Therefore, considerable stock on the dairy farms made farm manure which replaced much purchased fertilizer. However, until considerable stock is kept, the extra amount of manure which actually reaches the field does not greatly influence the amount of fertilizer purchased.

Truck Farms—Coastal Plain Soils.

The trucking industry of South Jersey is located upon the lighter and more sandy of the Coastal Plain soils. The topography and origin is similar to that of the potato area.

Crops.—The most common truck crops are sweet corn, asparagus, early potatoes, early tomatoes, carrots, lettuce, beans, rhubarb, cucumbers, melons, peppers, sweet potatoes, beets, onions, spinach, peas, egg plants, turnips, cabbage and others.

There is no regular rotation and the order of crops depends much upon the convenience of their arrangement.

Fertilizers and Manure.—Of a total of 300 truck farms studied, all used commercial fertilizers, 173 stable manure, 143 green manures, and 101 lime. The cost per crop acre for commercial fertilizers ranged from less than $1.20 to over $17.60; stable manure from less than $1.00 to over $12.90; for green manure seeds, from less than $.30 to over $1.80 per crop acre, while lime ranged from less than $.30 to over $2.10 per crop acre. The most successful truckers used a combination of all four fertilizers, manures, green manure crops and lime. Inasmuch as many truck crops do not allow for the growth of green manure, it appears as most essential that some manure must

be purchased. The truckers who used the heaviest applications of fertilizers, manure and green manure and lime, were the most successful. The most highly successful were those who made the green manure crops replace stable manure as far as possible.

The following data show the comparative results of heavy applications of stable manure, compared to commercial fertilizers and green manure crops.

TABLE VI.—*Relation of manure to crop yields and profits on 300 truck farms in New Jersey in 1914–15.*

Value of Manure per Acre.	No. of Farms.	Manure Cost per Crop Acre.	Lime Cost Crop Acre.	Fertilizer Cost per Crop Acre.	Crop Acres per Farm.	Receipts per Crop Acre.	Labor Income.
———	127	$——	$0.40	$6.00	38.09	$ 46.2	$299
0 –$ 2	55	1.00	.20	5.50	40.04	56.9	404
2.1–$ 4	39	2.80	.20	6.80	33.02	64.9	381
4.1–$ 6	30	4.90	.30	6.50	30.52	81.0	489
6.1–$10	31	7.40	.20	8.80	29.81	103.2	729
10.1–plus	18	12.90	.30	7.80	24.84	117.4	628
	300	2.20	.30	6.40	35.39	61.7	412

Relation of fertilizers to crop yields and labor income on 300 New Jersey truck farms.

Fertilizer Cost per Crop Acre.	No. of Farms.	Fert. Cost per Crop Acre.	Manure Cost per Crop Acre.	Lime Cost per Crop Acre.	Green Manure Cost per Acre.	Crop Acres.	Crop Receipts per Acre.	Labor Income.
$2 or less	25	$ 1.2	$1.5	$0.1	$0.3	33.58	$ 39.2	$373
2.1–$ 4	60	3.0	1.1	0.1	0.2	37.17	45.6	415
4.1–$ 6	82	5.0	2.0	0.4	0.2	38.70	54.0	342
6.1–$ 9	68	7.6	3.9	0.5	0.4	33.82	71.0	408
9.1–$15	49	11.0	2.9	0.2	0.5	34.97	85.5	555
15.1–plus	16	17.6	4.9	0.4	0.5	22.39	108.1	407
	300	6.4	2.2	0.3	0.3	35.39	61.7	412

Relation of green manure crops to crop yields and labor income on 300 New Jersey truck farms.

Value of Green Manure Seed per Acre.	No. of Farms.	Manure Cost per Crop Acre.	Fert. Cost per Crop Acre.	Lime Cost per Crop Acre.	Gr. Man. Cost per Crop Acre.	Crop Acre per Farm.	Crop Receipts per Acre.	Labor Income.
———	157	$1.4	$5.1	$0.3	$—	34.96	$49.4	$276.1
0 –$0.5	79	3.5	7.3	.2	.3	36.19	69.2	384.2
0.6–$1.0	37	1.7	8.2	.3	.7	37.88	81.4	927.6
1.1–$2.0	19	3.5	9.4	.6	1.4	32.68	85.9	476.8
2.1–plus	8	3.1	4.6	.4	1.8	30.73	73.8	827.0
	300	2.2	6.4	0.3	0.3	35.39	61.7	412.0

It is very evident that in all cases the heavier applications of manure, fertilizers or green manure crops gave the greatest yields. The trucker who applied six times as much manure as the average or three times as much fertilizer as the average, or grew two and one half times as much green manure crops, made the greatest profits. With the present desire to increase food production, these data have a vital bearing. Instead of clearing cut-over land or irrigating arid areas or draining swamps, fertilize the present tillable areas more. This would provide for an immediate increased production, make a more economical production, and would not injure farm lands throughout the country because large areas of cheap land would be brought under tillage which would compete with those now developed when Europe needs less of our food stuffs.

Of the materials necessary for increased production, stable manure is limited, but fertilizers and green manures would be plentiful.

In conclusion, it might be said that it is quite possible to maintain fertility and produce crops profitably on the general and potato farms through the use of commercial fertilizer and green manure. *Livestock does not appear to be essential in a region where green manure and especially leguminous green manure crops can be successfully grown.* From this, we might argue that one or two things are dominant, either livestock are merely a means of furnishing organic matter, or they merely are the means of returning plant food to the farm through the feeding of farm crops. The function of livestock in maintaining fertility probably will differ with the soil type or the locality. For example, in the Sussex area in all probability the most important function is to furnish plant food through the feeding of purchased concentrates, and the crops raised on the farm to the livestock; whereas, for some of the heavier soils, included in the Piedmont Plateau province, and the Coastal Plain province, livestock furnish plant food and organic matter in maintaining fertility of the soil. However, *it must be fully recognized that in each case, the maintenance of fertility is an essential in the management of the farm.* No plan of farm management which does not take into consideration the economical and proper maintenance of fertility, can be highly successful. Furthermore, this method will differ with the climatic condition, the soil type and the type of farming followed. Northern climates do not allow the successful use of cover crops, since the season is too severe and too short during which they can make their growth. Heavier soils are seldom so successful in the use of cover crops, whereas livestock farming seldom permits the use of cover crops to any appreciable extent, for most of the forage raised

on the farm is needed for feed. In such a case, the organic matter must be maintained through the provision of the heavy sods with the hay crop. On the lighter soils, heavy sods are very difficult to obtain, and the organic matter must be maintained either through the growing of green manure crops, or cover crops, or the purchase of stable manure. Truck farming does not always allow the use of green manure crops, because it interferes with the cropping sequence. The purchase of stable manure is too costly to allow the best profits, when it can be replaced by the green manure and cover crops which are the key to the most successful potato and truck as well as some general farms in New Jersey. Commercial fertilizers are needed to supplement both stable manure and green manure crops. Many farmers use too little fertilizers to obtain greatest profits in their farming operations. However, the American farmer is rapidly learning to use commercial fertilizers in the most profitable way. Education and experience are making rapid progress in our methods of maintaining fertility.